WHAT IS CLAIMED IS:

1. A process of preparing a solid composite including colloidal nanocrystals dispersed within a sol-gel host matrix, the process comprising:

admixing colloidal nanocrystals with an amphiphilic polymer including both hydrophobic groups and hydrophilic groups within a solvent to form an alcohol-soluble colloidal nanocrystal-polymer complex;

admixing the alcohol-soluble colloidal nanocrystal-polymer complex and a sol-gel precursor material; and,

forming said solid composite from said admixture.

2. The process of claim 1 wherein said colloidal nanocrystals have a volume loading of up to about 30 percent by volume within said solid composite.

3. The process of claim 1 wherein said hydrophilic groups are selected from the group consisting of -COOH, -OH, $-SO_3H$, $-NH_2$, and $-PO_3H_2$.

4. The process of claim 1 wherein said sol-gel precursor material is selected from the group consisting of metal alkoxide compounds, metal halide compounds, and metal hydroxide compounds where the metal is selected from the group consisting of silicon, titanium, zirconium, aluminum, vanadium, iron, tin, tantalum, cerium, and chromium.

5. The process of claim 1 wherein said colloidal nanocrystals are selected from the group consisting of M_1X_1, $M_1M_2X_1$, $M_1M_2M_3X_1$, $M_1X_1X_2$, $M_1M_2X_1X_2$, $M_1M_2M_3X_1X_2$, $M_1X_1X_2X_3$, $M_1M_2X_1X_2X_3$, and $M_1M_2M_3X_1X_2X_3$, where M_1, M_2, and M_3 are each selected from the group consisting of Zn, Cd, Hg, Al, Ga, In, Tl, Pb, Sn, Mg, Ca, Sr, Ba, mixtures and alloys thereof and X_1, X_2, and X_3 are each selected from the group consisting of S, Se, Te, As, Sb, N, P, mixtures and alloys thereof, Si, Ge, Au, Ag, Co, Fe, Ni, Cu, Mn and alloys of Au, Ag, Co, Fe, Ni, Cu, Mn or alloy combinations thereof.

6. The process of claim 1 wherein said colloidal nanocrystals are of PbSe.

7. The process of claim 6 wherein said colloidal nanocrystals have a volume loading up to at least about 13 percent by volume within said solid composite.

8. The process of claim 1 wherein the solid composite including colloidal nanocrystals uniformly dispersed within a sol-gel host matrix is characterized by

maintaining a major portion of photoluminescent quantum yield exhibited by the colloidal nanocrystals prior to incorporation into the sol-gel host matrix.

9. The process of claim 1 wherein said amphiphilic polymer is modified poly(acrylic acid) or modified poly(methacrylic acid), said modified poly(acrylic acid) or modified poly(methacrylic acid) including hydrophobic regions.

10. The process of claim 9 wherein said amphiphilic polymer is an octylamine-modified poly(acrylic acid).

11. The process of claim 1 wherein said sol-gel host is transparent.

12. The process of claim 1 wherein said colloidal nanocrystals are uniformly dispersed within a sol-gel host.

13. An alcohol-soluble colloidal nanocrystal-polymer complex comprising: colloidal nanocrystals and an amphiphilic polymer including hydrophilic groups selected from the group consisting of -COOH, -OH, $-SO_3H$, $-NH_2$, and $-PO_3H_2$.

14. The alcohol-soluble colloidal nanocrystal-polymer complex of claim 13 wherein said colloidal nanocrystals are coated with said amphiphilic polymer.

15. The alcohol-soluble colloidal nanocrystal-polymer complex of claim 13 wherein said colloidal nanocrystals are selected from the group consisting of M_1X_1, $M_1M_2X_1$, $M_1M_2M_3X_1$, $M_1X_1X_2$, $M_1M_2X_1X_2$, $M_1M_2M_3X_1X_2$, $M_1X_1X_2X_3$, $M_1M_2X_1X_2X_3$, and $M_1M_2M_3X_1X_2X_3$, where M_1, M_2, and M_3 are each selected from the group consisting of Zn, Cd, Hg, Al, Ga, In, Tl, Pb, Sn, Mg, Ca, Sr, Ba, mixtures and alloys thereof and X_1, X_2, and X_3 are each selected from the group consisting of S, Se, Te, As, Sb, N, P, mixtures and alloys thereof, Si, Ge, Au, Ag, Co, Fe, Ni, Cu, Mn and alloys of Au, Ag, Co, Fe, Ni, Cu, Mn or alloy combinations thereof.

16. The alcohol-soluble colloidal nanocrystal-polymer complex of claim 13 wherein said colloidal nanocrystals are of PbSe.

17. A solid composite comprising the reaction product of (i) colloidal nanocrystals complexed with an amphiphilic polymer including both hydrophobic groups and hydrophilic groups and (ii) a sol-gel precursor material.

18. The solid composite of claim 17 wherein said colloidal nanocrystals have a volume loading of up to about 30 percent by volume within said solid state composite.

19. The solid composite of claim 17 wherein said hydrophilic groups are selected from the group consisting of -COOH, -OH, $-SO_3H$, $-NH_2$, and $-PO_3H_2$.

20. The solid composite of claim 17 wherein the solid composite is characterized by maintaining a major portion of quantum yield exhibited by the colloidal nanocrystals prior to incorporation into the sol-gel precursor material.

21. The solid composite of claim 17 wherein said colloidal nanocrystals are selected from the group consisting of M_1X_1, $M_1M_2X_1$, $M_1M_2M_3X_1$, $M_1X_1X_2$, $M_1M_2X_1X_2$, $M_1M_2M_3X_1X_2$, $M_1X_1X_2X_3$, $M_1M_2X_1X_2X_3$, and $M_1M_2M_3X_1X_2X_3$, where M_1, M_2, and M_3 are each selected from the group consisting of Zn, Cd, Hg, Al, Ga, In, Tl, Pb, Sn, Mg, Ca, Sr, Ba, mixtures and alloys thereof and X_1, X_2, and X_3 are each selected from the group consisting of S, Se, Te, As, Sb, N, P, mixtures and alloys thereof, Si, Ge, Au, Ag, Co, Fe, Ni, Cu, Mn and alloys of Au, Ag, Co, Fe, Ni, Cu, Mn or alloy combinations thereof.

22. The solid composite of claim 17 wherein the colloidal nanocrystals are of PbSe.

23. The solid composite of claim 17 wherein said amphiphilic polymer is modified poly(acrylic acid) or modified poly(methacrylic acid), said modified poly(acrylic acid) or modified poly(methacrylic acid) including hydrophobic regions.

24. The solid composite of claim 23 wherein said amphiphilic polymer is an octylamine-modified poly(acrylic acid).

25. The solid composite of claim 17 wherein said sol-gel precursor material is selected from the group consisting of metal alkoxide compounds, metal halide compounds, and metal hydroxide compounds where the metal is selected from the group consisting of silicon, titanium, zirconium, aluminum, vanadium, iron, tin, tantalum, cerium, and chromium.

26. The solid composite of claim 17 wherein said sol-gel precursor material is transparent.

27. The solid composite of claim 17 wherein said colloidal nanocrystals are uniformly dispersed within a sol-gel host.